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1.0 INTRODUCTION

The Port of Bellingham (Port) intends to perform an interim action at the former Weldcraft Steel & Marine site (site) in Bellingham, Washington. The interim action will reduce the threat to human health and the environment from contamination present in site sediment and a limited contiguous upland portion of the site associated with the marine railway. The remaining upland portion of the site will be addressed separately by the final site cleanup.

The interim action will be implemented concurrently with the redevelopment activities:

- To prevent the further spread of contaminated sediments that would occur if redevelopment activities were implemented without the remediation of contaminated sediments
- Due to the limited amount of time available for in-water activity in order to protect sensitive aquatic species (e.g., chinook salmon), and
- To accommodate the needs of the Port's new tenant, Seaview Boatyard North, Inc.

Site redevelopment will result in sediment dredging within, and in some areas, beyond the sediment cleanup boundary to achieve minimum vessel draft requirements. As such, sediment cleanup and redevelopment activities must be closely coordinated and need to be implemented concurrently. The need for concurrent implementation of sediment cleanup and redevelopment dredging activities in conjunction with the schedule for site redevelopment is an important consideration in the Port's intent to implement sediment cleanup as an interim action rather than part of the final site cleanup.

It is intended that the interim action achieve final cleanup for sediment. However, post-construction sediment quality compliance monitoring will be conducted and additional sediment cleanup may be required if Washington State Sediment Management Standards (SMS; WAC 173-204) Sediment Quality Standards (SQS) are not achieved throughout the site.

The combined interim action/redevelopment project is expected to result in significant improvements to nearshore marine habitat in the Squalicum Harbor area. The primary objectives of the project are to:

- Remediate contaminated sediments impacted by boatyard activities of the former site tenant, Weldcraft Steel & Marine through the interim action described in this work plan
- Implement site repairs and improvements necessary to allow continuing site use as a water-dependent boatyard by the Port's new tenant, Seaview Boatyard North, Inc.
- Provide significant new marine habitat in the project vicinity, in addition to compensatory mitigation for the effects on habitat of site improvements and repairs
- Beneficially re-use dredged material from the maintenance dredging of the Squalicum channel for construction of the new marine habitat element of the project.

These project objectives are consistent with and support the Comprehensive Strategy for Bellingham Bay to integrate improvements to land use, habitat, and contaminated sediment remediation, as described in the October 2000 Final Environmental Impact Statement (FEIS; Anchor Environmental 2000), developed under the multi-agency Bellingham Bay Demonstration Pilot Study. This project is also strongly supported by the Whatcom County Marine Creosoted Piling Remediation Program being administered by the City of Bellingham through a grant from the Washington State Department of Ecology (Ecology 2002) because of the significant reduction (greater than 80 percent) of creosote in the marine environment that will be achieved at the site from proposed timber removal and isolation.

This interim action plan was prepared in accordance with the Washington State Department of Ecology (Ecology) Model Toxics Control Act regulations (MTCA; WAC 173-340-430) and the SMS. The objective of remediating contaminated site sediments is consistent with Ecology's antidegradation policy (WAC 173-204-120). The interim cleanup action is intended to result in a post-dredge sediment surface that meets SMS SQS and other applicable criteria. The Port, as the owner of the property, faces potential liability for environmental contamination at the site under the MTCA and SMS. Cleanup of the site, including efforts taken as part of the interim action described in this work plan, will be conducted under an agreed order between the Port and Ecology.

1.1 SITE LOCATION

The site is located on Port property at Section 25, Township 38 North, Range 2 East, within and adjacent to Squalicum Outer Harbor near the intersection of Squalicum Way and Harbor Loop Drive in Bellingham, Washington. The site vicinity map is shown on Figure 1, and an annotated aerial photograph of the site taken in the spring of 2002 is shown on Figure 2.

The street address for the site is 2652 Harbor Loop Drive, Bellingham, Washington, 98225, and the current tenant is Seaview Boatyard North, Inc. The site is on Port property that has provided water-dependent services for over 50 years. The City of Bellingham Shoreline Master Program designates Bellingham Bay as "urban maritime" (City of Bellingham 1989).

1.2 SITE HISTORY

Historic fire insurance maps from 1904 and 1913 show the site area was undeveloped tidelands of Bellingham Bay. In the 1920s, the area was filled with material dredged during construction of the Squalicum Waterway. By the 1940s and 1950s, various large businesses began operation in the filled areas along the waterway (Landau Associates 1993). Construction of the existing breakwater and dredging of the Squalicum marina area to -12 ft MLLW occurred in the early 1950s.

The Port became owner of the site in 1927. Weldcraft Steel & Marine first leased the site in 1946 and was initially involved in general boat repair activities. The company was known as Weldcraft Steel Works until 1961, Weldcraft Steel and Tank from 1961 to 1972, and Weldcraft Steel & Marine (Weldcraft) from that point forward. Weldcraft operated primarily as a shipyard that conducted various activities, including boat construction, repair, and maintenance; wood and metal fabrication; marine pipefitting; electrical and electronic work; sheet metal work; painting; machinery construction, installation and repair; vessel haul-out and launching; lofting and pattern-making; canvas and plastic work; storage, brokerage, retail, and wholesale sales; and concrete work.

The Port's lease with Weldcraft was terminated in February 2000 and the Port obtained full operational control of the site in July 2000. The site has been occupied by Seaview Marine, operating as Seaview Boatyard North, Inc., a company that performs general boat repair activities, since April 2002.

1.3 EXISTING SITE FEATURES

Existing site features are shown on Figures 3 and 4 and summarized below, with an emphasis on site features within the nearshore work areas versus the upland portions of the site. The relationship between true north and plan north being used for the project is indicated on Figures 3 and 4 and on other plan view figures.

The upland portion of the site is relatively flat with a surface elevation of between 13 and 15 ft mean lower low water (MLLW). A bathymetric survey of the near-shore marine area of the site was performed by Blue Water Engineering of Seattle, Washington on October 10, 2001. The survey extended about 500 ft southwest of the shoreline in the marine railway vicinity. The horizontal survey data were referenced to Washington State plane coordinates - north zone (NAD 83). The vertical data were referenced to MLLW datum. The bathymetric survey data were supplemented by spot mudline elevation measurements made by Landau Associates along the bulkhead and under the wharf. The resulting bathymetric contours are shown on Figure 3.

The timber bulkhead along the waterfront on the north and east sides of the site supports the upland fill areas adjacent to Squalicum Harbor. The timber bulkhead is constructed of creosote-treated timber piles that support horizontal timber lagging with tieback rods and deadman anchors at most pile locations. About 176 ft of bulkhead along the north side of the site is covered by an existing wharf. The bulkhead alignment has been subdivided into three segments (A, B, and C) for Port planning purposes, as indicated on Figure 3. The bulkhead lengths for Segments A, B, and C are approximately 144 ft, 222 ft, and 258 ft, respectively.

The marine railway is a creosote-treated timber pile-supported structure that extends from the upland railway well area (approximately 30 ft wide by 100 ft long) into the water about 235 ft beyond the

timber bulkhead. A row of creosote-treated timber mooring piles is located just north of the marine railway. The marine railway is constructed on bents alternately supported by two and three timber piles, with timber pile caps and stringers supporting two steel rails. The marine railway platform that travels on the two steel rails is constructed with steel framing and creosote-treated timber decking. The sides of the railway well are supported by creosote-treated timber piles and lagging supplemented with concrete side walls along a portion of the structure. A concrete-lined vault at the east end of the railway well houses the winch and cable assemblies previously used to move the platform along the marine railway.

The existing 35-ton travel lift pier structure is supported on pairs of timber piles with timber cross bracing (Figure 3). Each pier is about 6 ft wide (including the walkway), and the timber and steel carrier beams extend about 77 ft beyond the timber bulkhead and a short distance upland from the bulkhead. The north travel lift float is a timber structure that extends about 350 ft beyond the timber bulkhead and is secured by fifteen timber piles, while the smaller south float is secured to the southern travel lift pier.

The wharf along the north side of the site within Segment C is a creosote-treated timber pile-supported structure with timber decking, stringers, pile caps, and cross bracing (Figure 3). The Segment C wharf is approximately 30 ft wide and 176 ft long. The upland edge of the wharf extends beyond the alignment of the underlying timber bulkhead, as indicated on Figure 3. A small building is situated on the eastern side of the wharf and also extends upland onto the gravel surfaced area beyond the alignment of the bulkhead, as shown on Figures 3 and 4.

A creosote-treated timber pile-supported wharf to the west of Segment C has concrete decking and exhibits extensive degradation of the piles and superstructure members (Figure 3). This structure is not located within the interim action area and is not part of the presently planned site redevelopment. As such, this western wharf segment will not be addressed as part of this project.

The upland areas to the east of the bulkhead in Segment B contain several small sheds, several buildings, open storage and work areas, parking areas, and a grass bioswale, as indicated on Figures 3 and 4. The area north of the railway well is currently a gravel surfaced storage area, while the areas south of the railway well are paved with asphalt concrete. Access to upland site areas adjacent to bulkhead Segments B and C is limited by existing security fencing and gates. The upland areas to the east of the bulkhead in Segment A contain structures and paved parking areas associated with the Squalicum Yacht Club and the Bellingham Yacht Club. The upland area adjacent to bulkhead Segment A is not affected by site releases and access to this area is unrestricted.

Several active and abandoned stormwater outfall pipes extend through the timber bulkhead on the north and east sides of the site, as indicated on Figure 3. The origin and use of these outfalls are being investigated as part of the MTCA interim cleanup to the extent necessary to identify and abandon inactive outfalls prior to construction of the new bulkhead. The investigation will consist of one or more of the

following methods to evaluate the source(s) discharging to these outfalls and whether the outfalls are active:

- Review available utility drawings
- Observe outfalls during periods of significant precipitation to determine whether the outfalls convey storm water
- Discharge of clean water to catch basins and other potential source locations during dry periods
- Discharge of non-toxic and biodegradable dye tracers.

The outfall investigation to identify inactive outfalls will be completed by June 2003. Outfalls determined to be inactive will be abandoned by plugging with concrete and/or capping. Outfalls that are determined to be active will be evaluated by the Port consistent with requirements under the National Pollutant Discharge Elimination System (NPDES).

It is important to recognize that the distribution of sediment contamination at the site indicates that the primary source of sediment contamination is the marine railway and possibly the existing travel lift area, as described in Section 2.2.2, and does not indicate that the existing outfalls are a source of sediment contamination. Additionally, the Port has previously performed maintenance activities on the site stormwater system to limit potential contaminant releases to site sediment and surface water resulting from stormwater discharges, as described in Section 2.4. Also, Seaview Boatyard North has improved site stormwater management and treatment practices since its tenancy in 2002. Seaview Boatyard North stormwater improvements include construction of a closed loop, self-treating boatyard pressure wash water treatment system and construction of new improvements to treat site stormwater runoff from paved areas outside the pressure wash facility, as described in Section 2.4. As a result, site storm water should not result in surface water or sediment quality impacts to the site, nor do outfall discharges at the site that may originate from other facilities appear to be adversely impacting site sediment.

Some of the floating piers associated with the Squalicum Harbor marina facility are directly south of the site and will affect contractor access to certain project work areas. These piers are shown on Figures 2 and 3.

1.4 REGULATORY FRAMEWORK

Site cleanup, including this interim action, is being accomplished under MTCA. Because site sediments are one of the affected media, the Washington State Sediment Management Standards (SMS; WAC 173-204; Ecology 1995) are also directly applicable to site cleanup. Ecology involvement in site cleanup-related investigation activities conducted to date was facilitated through informal

consultation. Future cleanup activities, including this interim action, will be conducted under an agreed order between the Port and Ecology.

1.5 REPORT ORGANIZATION

Section 2.0 of this report presents a summary of site environmental conditions. Section 3.0 presents the evaluation and selection of the interim action for the site. Section 4.0 summarizes the use of this report. Section 5.0 presents the references for this document.

2.0 SITE ENVIRONMENTAL CONDITIONS

This section presents site environmental conditions and discusses site geologic and hydrologic conditions, the nature and extent of contamination for affected media (sediment and soil) in the interim action area, and other relevant site data. Data collection and evaluation of site conditions was performed in a phased manner. Initial identification of potential environmental affects occurred during the Phase I environmental site assessment (ESA) in 1993. A Phase II ESA was conducted in 1998 to assess impacts to site soil, groundwater and sediment. A supplemental sediment investigation was conducted in 2000, and a sediment remedial investigation was implemented in 2001. Figure 5 presents the sediment sampling locations. The results of these investigations and the associated data relevant to site conditions are integrated in this section to provide the reader a comprehensive understanding of site conditions. Information from previous site investigations that are not relevant to the planned interim action area (i.e., the Phase III upland investigation and the ongoing upland RI) are not presented in this work plan, but will be presented as part of the remedial investigation/feasibility study (RI/FS) report for the upland portion of the site.

This section is organized into the following subsections: Environmental Investigations (Section 2.1), Sediment Quality (Section 2.2), Upland Conditions (Section 2.3), Previous Decommissioning and Maintenance Activities (Section 2.4), and Interim Action Cleanup Levels (Section 2.5).

2.1 ENVIRONMENTAL INVESTIGATIONS

This section provides a description of the site investigation activities conducted within the interim action area. Relevant site investigations included the Phase I and II ESAs, a supplemental sediment investigation, and the sediment RI. A summary of the sediment sampling activities and the associated sample analyses is presented in Table 1. Sediment sampling locations are shown on Figure 5.

2.1.1 PHASE I ESA

The Phase I ESA (Landau Associates 1993) consisted of research and review of historical information for the Weldcraft site; contacts with local, state, and federal government regarding the site and properties of potential concern within a 1-mile radius; a site reconnaissance; data evaluation; and reporting. The Phase I ESA identified various areas of potential environmental concern, primarily related to poor housekeeping practices during site operations (Landau Associates 1993). Specific items of concern to sediment quality that were identified included:

- Historic sandblasting activities in the yard and buildings, and near the marine railway at the site, that could be a source of heavy metal impact to soil, groundwater, and sediment
- Potential impacts to sediments due to an outfall located in the bulkhead south (plan west) of the site buildings; the origin and use of the outfall were not identified.

2.1.2 PHASE II ESA

The Phase II ESA (Landau Associates 1998) was completed at the site to evaluate the conditions of potential concern noted in the findings of the Phase I ESA. The scope for the Phase II ESA consisted of sampling and chemical analysis of soil, groundwater, and sediment at various locations where available information and observations suggested that past practices, or ongoing practices at the time of the Phase II ESA, may have impacted the environment. Chemical testing was performed on samples from areas of the site most likely to show environmental impact from site activities, including sediment in the vicinity of shoreline operations and outfall areas. Sample descriptions, depth, and analysis parameters for sediment samples collected during the Phase II ESA are presented in Table 1.

The Phase II ESA included the following sediment investigation activities. On January 22, 1998, Landau Associates collected surface sediment samples (0-10 cm depth) from three locations near the south edge of the site in areas where site activities and/or runoff from the site may have impacted sediment quality. The sediment sample locations are shown on Figure 5. Each of the sediment samples (SD-MW, SD-TL, and SD-OF) underwent analysis for SMS metals, semivolatile organic compounds (SVOC), bulk butyltins including tributyltin (TBT), and total organic carbon (TOC). In addition, the sample located near the outfall pipe (SD-OF) was analyzed for polychlorinated biphenyls (PCB). Analytical results are discussed in Section 2.2.

On January 22, 1998, Landau Associates collected a sample of accumulated waste solids in the upper intertidal portion of the marine railway, within the marine railway well, at the site for laboratory analysis. The sample was obtained to assist in profiling the solid material for future waste disposal. The marine railway waste sample location, labeled “Railway Waste Sample”, is shown on Figure 5. Analytical parameters for the marine railway waste sample are presented in Table 1. Analytical results for the marine railway waste sample are discussed in Section 2.2.

2.1.3 SUPPLEMENTAL SEDIMENT SAMPLING

The objective of the supplemental sediment investigation (Landau Associates 2001a) was to collect additional information to further evaluate sediment quality conditions beyond the area investigated during the Phase II ESA. On November 21, 2000, surface sediment samples were collected at five

locations offshore from the upland area of the site (SD2-01 through SD2-05, as shown on Figure 3). Bulk sediment samples were analyzed for SMS metals, SVOC, butyltins, TOC, and grain size. Table 1 presents the analytical parameters for the supplemental sediment sampling. Analytical results for the supplemental sediment investigation are discussed in Section 2.2.

2.1.4 SEDIMENT REMEDIAL INVESTIGATION

The objective of the sediment RI was to evaluate the horizontal and vertical extent of potential sediment contamination. Surface sediment samples (0-10 cm) were collected from seven locations (RIFS-01 through RIFS-07) using a stainless-steel power grab sampler. Multiple grabs were necessary at some stations to collect a sufficient volume of sediment for analysis. A total of ten subsurface sediment samples were collected at five locations (RIFS-01 through -04 and RIFS-07) to a depth of approximately 8 ft below the mudline. Subsurface sediment samples were collected with a vibracore with an aluminum core tube attached. The sampling locations (stations) were selected to evaluate the horizontal and vertical extent of potential contamination that may require remediation under SMS and MTCA. Sample coordinates are presented in Table 2, and sampling locations are shown on Figure 5.

Three of the surface sediment samples were co-located with samples collected during previous investigations to allow the use of the previously collected bulk sediment data with TBT porewater data collected during the RI. RIFS-03 was co-located with sample SD-TL from the Phase II ESA investigation. RIFS-04 was approximately co-located with SD-MW from the Phase II ESA investigation. RIFS-05 was co-located with SD2-01 from the supplemental sediment investigation. Because of difficulties in sample recovery, in part caused by the presence of the marine railway, RIFS-04 was collected about 30 ft west of SD-MW, rather than precisely co-located.

Surface sediments generally consisted of black silt and silty clay. Surface sediment field observations and sampler penetration are summarized in Table 3. Core logs based on a compaction corrected depth scale are presented in Appendix A.

Surface sediment samples that were approximately co-located with samples from previous locations (RIFS-03, RIFS-04 and RIFS-05) were analyzed for porewater TBT and dissolved organic carbon. Surface sediment samples collected in the vicinity of the marine railway (RIFS-01 and RIFS-02) were analyzed for SMS metals, SVOCs, porewater and bulk butyltins, and a suite of SMS conventional parameters (i.e., grain size, TOC, total sulfides, and ammonia). Outlying samples (RIFS-06 and RIFS-07), where previous investigations indicated TBT was the only potential constituent of concern, were tested for porewater and bulk butyltins, TOC, and DOC. Based on surface sediment analytical results, which indicated metals and bulk TBT were the primary contaminants of concern, subsurface sediment samples RIFS-01(0-4 ft), RIFS-02(0-4 ft), RIFS-02(4-8 ft), RIFS-03(0-4ft), RIFS-03(4-8 ft),

RIFS-04(0-4 ft), and RIFS-04(4-8 ft) were analyzed for total metals and bulk TBT to determine the vertical extent of SMS exceedances. Analytical results for the sediment RI are discussed in Section 2.2.

2.2 SEDIMENT QUALITY

Site sediment environmental conditions were evaluated based on analytical results for sediment samples generated during the Phase II ESA, supplemental sediment investigation, and sediment RI. The analytical results were used to evaluate the nature and extent of contamination resulting from the presence and release of wastes or hazardous substances associated with site activities. Sediment quality was evaluated based on SMS sediment quality standards (SQS) and cleanup screening levels (CSL). The SQS represents the concentration below, which no adverse affects should occur. The CSL represents the concentration above which more than minor adverse affects may occur.

All sediment analytical data were validated prior to use. Data validation results for pre-RI investigations are described in previous documents (Landau Associates 1998 and 2001a). Data validation for the RI was conducted in accordance with the procedures identified in the RI Work Plan (Landau Associates 2002). A number of metals were qualified as estimated (J) as a result of precision outside of laboratory control limits. TBT and zinc were qualified as estimated (J) because of accuracy outside of laboratory control limits. No RI data were rejected and the data, as qualified, are acceptable for use. Details of the RI laboratory data quality evaluation are provided in Appendix B to this report.

2.2.1 PRELIMINARY SEDIMENT CLEANUP LEVELS

The sediment analytical results were compared to SQS and CSL criteria, and are summarized in Table 4. Laboratory reports are presented in Appendix B for sediment RI data, and are presented in the applicable reports for prior investigations.

The railway sample collected during the Phase II ESA was not tested for TOC because it consisted primarily of boat maintenance waste and was collected primarily for waste designation rather than environmental media (sediment) characterization. As a result, the railway sample was not analyzed for all the SMS parameters that sediment samples are typically tested for (e.g., conventionals) and was tested for some parameters that sediment samples are not typically tested for (e.g., total petroleum hydrocarbons). For the purposes of comparison of organic compounds to sediment quality criteria, a TOC of 2 percent was assumed for the railway sample. The marine railway analytical results are compared to SQS and CSL criteria and summarized in Table 5.

The SMS provides SQS and CSL cleanup standards for many constituents. However, SMS cleanup standards for TBT have not been promulgated at this time. However, Puget Sound Dredge

Disposal Analysis (PSDDA) evaluation criteria for open water disposal identifies a no effects TBT sediment porewater criteria of 0.05 µg/L and a potential adverse affects sediment porewater criteria of 0.15 µg/L for open water disposal of dredged material that provide a reasonable basis for assessing the potential affects of TBT on marine biota. For the purposes of this evaluation, a TBT porewater concentration of 0.05 µg/L is considered analogous to the SQS and a TBT porewater concentration of 0.15 µg/L is considered analogous to the CSL.

Because significantly more bulk TBT data are available than pore water TBT data, a correlation between bulk and porewater TBT concentrations was developed to allow a more comprehensive evaluation of the extent of TBT contamination based on bulk TBT data. A linear regression analysis was performed for co-located porewater and bulk TBT data. A strong correlation with an R^2 of 0.96 was obtained for the six available data points, as shown on Figure 6. Based on this linear regression, the preliminary site-specific bulk TBT criteria are 79 µg/kg and 156 µg/kg based on the PSDDA TBT porewater evaluation criteria of 0.05 and 0.15 µg/L, respectively.

As indicated in Section 2.1.4, RIFS-04 was located about 30 ft west of its intended co-location with SD-MW because of sample recovery difficulties. Because the TBT porewater concentration for the RIFS-04 sample (0.022 U µg/L) is very low relative to the bulk concentration for the SD-MW sample (1400 µg/kg), and the samples were not precisely co-located, the TBT data from RIFS-04 and SD-MW were not used in the linear regression.

For ease of interpretation and review, sediment quality exceedances were normalized for graphical presentation by dividing the measured concentration by the SQS and CSL criteria. Thus, an exceedance ratio greater than 1 indicates that the respective criteria was exceeded. This exceedance ratio approach provides the reader with a relative measure of the level of exceedance for multiple constituents without the need to refer to the individual criteria. Figures 7 and 8 present the extent of contamination for surface and subsurface sediment quality samples, respectively.

It should be noted that exceedance ratios for the railway sample are only presented on Figure 7 for metals (including TBT). Organic compound exceedances are not presented on the figure because concentrations are based on an assumed TOC concentration, and the extensive number of criteria exceedances in the railway sample make graphical presentation of all exceedances impractical. Additionally, most of the organic compounds only exceed SMS criteria in the railway sample, so graphical presentation is not necessary.

It should be noted that the laboratory reporting limits exceeded SQS or CSL values for a limited number of constituents (primarily chlorinated benzenes, phenols and benzoic acid) in some samples. However, these constituents have not been detected in upland soil or groundwater samples, nor were they

detected in samples that did not have elevated reporting limits. As a result, the reporting limit exceedance of SQS or CSL values for these constituents in a limited number of samples does not significantly compromise the completeness of sediment quality data, or its usability.

2.2.2 SUMMARY OF FINDINGS

As indicated in Table 4, sediment quality exceedances occurred in surface sediment samples and sediment core samples collected from 0.1 to 4 ft below mudline. No sediment quality exceedances were detected in samples collected from 4 to 8 ft below mudline. As a result, subsequent discussion of subsurface sediment quality is in reference to the 0.1 to 4 ft zone.

Figures 7 and 8 present surface and subsurface sediment SMS exceedances and preliminary site-specific bulk TBT criteria exceedances. TBT and mercury appear to be the most common constituents of concern in the site sediment.

Surface sediment contained concentrations of bulk TBT, likely from shipyard activities, above the preliminary site-specific TBT screening criteria. TBT exceedances extend southwest of the marine railway to co-located samples SD2-01 and RIFS-05. Bulk TBT concentrations tend to decrease from surface to subsurface sediment, indicating TBT is a more recent contaminant. The vertical extent of TBT exceedance is limited to the upper 4 ft of sediment. The decrease in bulk TBT concentration with depth and the observed stratigraphy suggest that the vertical extent of bulk TBT exceedances may be less than 4 ft.

Surface sediment exceedances of mercury were limited to sample RIFS-02 and the railway sample. However, subsurface sediment exceedances of mercury were observed in samples RIFS-02(0-4), RIFS-03(0-4), and RIFS-04(0-4). Observed mercury exceedances extend southwest of the marine railway to core RIFS-04. The vertical extent of mercury exceedances appears to be limited to the upper 4 ft of sediment. Mercury concentrations tend to increase from surface to subsurface sediment, indicating mercury is an historical contaminant.

Other sediment quality exceedances at the site, excluding the numerous organic and inorganic exceedances in the railway sample, consist of:

- Bis(2-ethylhexyl)phthalate (BEP). Surface sediment exceedances at RIFS-02 (SQS exceedance ratio of 1.3) and SD-MW (CSL exceedance ratio of 1.1).
- Fluoranthene. Surface sediment exceedance at SD-TL (SQS exceedance ratio of 1.7).
- Copper. Surface sediment exceedance at RIFS-02 (CSL exceedance ratio of 2.1).

The locations of these exceedances fall within the extent of the TBT and mercury exceedances. Additionally, the numerous additional exceedances detected in the railway sample are limited to the upper intertidal and upland portion of the marine railway.

Marine railway exceedances include the metals arsenic, cadmium, copper, lead, mercury, zinc, and bulk TBT. Organic compound exceedances in the railway sample include numerous low molecular weight polycyclic aromatic hydrocarbons (PAHs), high molecular weight PAHs, BEP, dibenzofuran, and n-nitrosodiphenylamine. The marine railway sample was also analyzed for gas, diesel, and oil range total petroleum hydrocarbons (TPH). There are no SMS criteria for TPH. However, the concentrations of gas, diesel, and oil range TPH (1600, 16,000, and 17,000 mg/kg, respectively) were elevated in the railway sample.

Based on the distribution of site sediment contamination, the marine railway near its upland terminus appears to be the primary source of sediment contamination. To a lesser extent, the travel lift vicinity may have also contributed to sediment contamination in the past. Available data do not suggest that existing outfalls are a significant source of site sediment contamination.

2.3 UPLAND CONDITIONS

This section summarizes upland conditions that are relevant to the proposed interim action. The primary relevance of upland conditions to the proposed interim action is the potential for future upland releases of contaminants to sediment following implementation of the interim action. The potential sources for future releases to sediment are groundwater discharge, surface soil erosion, and/or discharges through site stormwater outfalls.

As part of the upland investigations, nine monitoring wells have been installed and sampled on the site, and groundwater samples have been collected from six geoprobes. Of these 15 groundwater monitoring locations, three wells are within about 40 ft of the shoreline and two additional wells and four geoprobes are within about 100 ft of the shoreline, as shown on Figure 9. Based on review of available data, including preliminary data from the ongoing upland RI, all constituents of concern identified in site sediment were either not detected, or were detected at concentrations below surface water quality criteria in the nine groundwater monitoring locations in close proximity to the shoreline. Additionally, no other environmental constituents were detected in these nine groundwater monitoring locations at concentrations exceeding surface water quality criteria. Groundwater analytical data associated with these monitoring locations will be presented in the upland RI/FS report.

Based on existing site conditions, soil erosion and transport via surface/stormwater into the marine environment is unlikely to occur. As previously noted in Section 1.3, the project site is relatively flat and the majority of the site is paved. Surface water runoff is collected in stormwater catch basins or

dry wells, and there is no indication of direct surface water runoff or soil erosion to surface water and sediment. As indicated in Section 1.3, the distribution of site sediment contamination indicates that contamination is associated with the marine railway and possibly the travel lift, and does not indicate a significant contribution from outfalls that discharge within the site vicinity. As indicated in Section 1.3, and further discussed in Section 2.4, the Port cleaned existing site catch basins and floor drains prior to occupancy by its new tenant (Seaview Boatyard North) and Seaview Boatyard North has made significant improvements to the site stormwater collection and treatment system. As a result, storm water is not considered a significant contaminant source to site sediment.

Soil samples collected during previous investigations indicate that site contamination (including soil) is limited and localized, with no significant environmental issues in close proximity to the shoreline. As a result, the potential for recontamination of sediment from the erosion of contaminated soil appears to be very limited. However, further assessment of the upland portion of the site will occur at a later date under the Ecology/Port agreed order and additional work may be done to eliminate any contamination sources that are identified at that time.

Section 2.4 summarizes the actions taken to minimize the potential for recontamination of sediment in the interim action area from site stormwater outfall discharges.

2.4 DECOMMISSIONING AND MAINTENANCE ACTIVITIES

The Port performed a number of relevant environmental decommissioning and maintenance activities in the upland portion of the site in preparation for use by the new tenant. As part of this work, the Port cleaned out three catch basins and two floor drains, and removed an apparent septic tank from the west side of Building 1, in January 2000 (Landau Associates 2001b) (Figure 4). The Port removed accumulated sediment from the catch basins and floor drains to prevent potential future releases of these historically generated contaminants to site sediment and Bellingham Bay through the stormwater conveyance system. The apparent septic tank was removed because it was thought to be a petroleum hydrocarbon underground storage tank, although upon excavation it appeared to be a small septic tank with an attached drain line; laboratory analysis of the tank contents did not indicate the presence of hazardous substances at concentration of concern.

In addition to the maintenance and decommissioning activities described above, the Port removed a large quantity of waste materials left onsite from the previous tenant. Waste materials included derelict boats, used oil, scrap metal and fiberglass, unused paints and solvents, and other wastes typically associated with boatyard activities. All waste materials were disposed of in compliance with applicable regulations.

Seaview Boatyard North, Inc. has subsequently constructed a closed, self-treating boatyard water treatment system that retains, treats, and recycles water from the pressure wash facility. Additionally, they have also constructed new improvements to treat site stormwater runoff from paved areas outside the pressure wash facility, including a bioswale that treats stormwater runoff to Ecology standards prior to release into the marine environment (Figure 3). These treatment systems offer a significant improvement in surface water quality over site discharges during the past 50 years.

The Port is also evaluating several outfalls that terminate at the site bulkhead, as shown on Figure 3. The Port is evaluating whether the outfalls are still active, and if inactive, they will be abandoned prior to construction of the new bulkhead. The results of this evaluation, and the location and manner in which inactive outfalls were abandoned, will be presented in the site-wide RI/FS report to be completed subsequent to the interim action. The source(s) of discharge to the outfalls that are active will be evaluated consistent with NPDES requirements.

As noted previously, further assessment of the upland portion of the site will occur at a later date under the Ecology/Port agreed order. Follow-up evaluation of the sediment portion of the site will also occur. Additional work may be done to eliminate any contamination or contamination sources that are identified at that time.

2.5 INTERIM ACTION CLEANUP LEVELS

The SQS, and the site-specific TBT no-effects cleanup level will be the sediment cleanup levels used for the interim action. It is anticipated that if these cleanup levels are achieved throughout the site, the interim action will constitute the final cleanup action for sediment. However, final cleanup level will be determined by Ecology. If the identified cleanup levels are not achieved throughout the site, additional sediment cleanup may be required.

As indicated in Section 2.2.2, the primary constituents of concern are TBT and mercury. Other hazardous substances that exceeded the SQS, excluding the numerous organic and inorganic exceedances in the railway sample, consist of copper, BEP and fluoranthene. The cleanup levels for these constituents of concern are presented in Table 6.

3.0 INTERIM ACTION

This section presents a summary of the evaluation and selection of the interim action planned for the site.

This section is organized into the following subsections: Purpose of the Interim Action (Section 3.1), Alternative Interim Actions Considered (Section 3.2), Interim Action Design and Construction Details (Section 3.3), Construction Timing (Section 3.4), and Compliance Monitoring (Section 3.5).

3.1 PURPOSE OF THE INTERIM ACTION

The purpose of the interim action is to remediate contaminated sediment affected by the activities of the prior site tenant, Weldcraft Steel & Marine. The Port is planning to remediate site sediment in conjunction with the redevelopment of the boatyard facility in Squalicum Harbor, which has been in operation for over 50 years. The Port recently evicted the prior tenant and entered into a new lease agreement with Seaview Boatyard North, Inc. to operate the boatyard. This change has provided the opportunity to address problems associated with the prior tenant's operations, including upland and sediment contamination, dilapidated structures, and non-compliance with current regulatory requirements. The interim action and redevelopment will be conducted consistent with the goals of the Comprehensive Strategy, including cleanup of a high priority contaminated sediment site and construction of a high priority habitat restoration site identified in the FEIS (Anchor Environmental 2000). Additionally, the interim action and redevelopment removes a significant amount of creosoted timbers and piling, consistent with the goals of the Whatcom County Marine Creosoted Piling Remediation Program (Ecology 2002).

The sediment cleanup and redevelopment elements of the project are interdependent, and as a result, both aspects of the project are presented in this plan. The proposed interim action consists of the following four major in-water construction elements:

- Sediment dredging to remove contaminated sediment above the SQS
- Installation of a new steel sheet pile bulkhead in front of the existing timber bulkhead where contaminated sediments are to be removed (existing bulkhead to be left in place)
- Removal of the marine railway to facilitate dredging of contaminated sediments
- Construction of new marine habitat along the Squalicum Outer Harbor breakwater to address habitat losses associated with post-construction dredge depths and the location of the new bulkhead.

In conjunction with these interim action activities, the following site redevelopment activities will be implemented:

- Construction of a 150-ton travel lift pier to replace the marine railway
- Sediment dredging to attain adequate vessel drafts (-10 ft MLLW) in the vicinity of the new 150 ton travel lift
- Installation of a new steel sheet pile bulkhead in front of the existing timber bulkhead along portions of the bulkhead alignment adjacent to the portion being replaced to facilitate removal of contaminated sediments (existing bulkhead to be left in place)
- Repair of the existing timber bulkhead along the north shoreline
- Repair/replacement of damaged timber piles associated with the existing wharf and north timber bulkhead and the north travel lift float
- Repair/replacement of selected structural elements of the existing wharf.

This project is focused on the in-water portion of the site. Upland remediation will be addressed separately, following completion of a site-wide remedial investigation/feasibility study to be conducted under an agreed order between the Port and Ecology.

The Port will perform this interim action in accordance with the MTCA and the SMS. The interim action will reduce the threat to human health and the environment from chemicals present in site sediment and a limited contiguous upland portion of the site associated with the marine railway.

3.2 ALTERNATIVE INTERM ACTIONS CONSIDERED

Sediment remedial action alternatives that were considered for this site included: 1) monitored natural recovery; 2) capping of contaminated sediments; and 3) complete excavation of contaminated sediments (the selected alternative).

The alternative that would rely on natural attenuation of the contaminated sediments at the site was not selected because of the uncertainty associated with the efficacy of this approach, as well the high probability that some future sediment remedial activities would be required at the site for reasons of either environmental cleanup or boat access.

The capping alternative would rely on at least 2 ft of clean sand to cap contaminated sediment to mitigate potential exposure pathways to biological or human receptors. However, this alternative was not selected because sediment capping would result in vessel drafts too shallow to allow the site to continue its historic marine-dependent use as a boatyard.

Complete excavation of contaminated sediment was selected as the most appropriate alternative because it provides a high level of protection to human health and the environment, and provides for the continued use of the site for marine-dependent activities.

3.3 INTERIM ACTION DESIGN AND CONSTRUCTION DETAILS

The focus of this interim action is the in-water and over-water work in the project area. The in-water work will occur only during the period identified by the U.S. Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS) as least disruptive to salmon and trout migration. It is presently anticipated that the interim action will be implemented between September 1, 2003 and February 15, 2004. As described in Section 3.2, the interim action and associated site redevelopment activities will consist of the following four major in-water construction elements:

- Sediment dredging to remove contaminated sediment and restore minimum vessel draft requirements for access to the boatyard
- Installation of a new steel sheet pile bulkhead in front of the existing timber bulkhead (to be left in place) along the east shoreline
- Replacement of the marine railway with a 150-ton travel lift pier
- Construction of new marine habitat along the Squalicum Outer Harbor breakwater.

The removal and/or isolation of significant areas of creosote-treated wood is another major in-water benefit of site remediation. This project is strongly supported by the Whatcom County Marine Creosoted Piling Remediation Program (Ecology 2002) because of the significant reduction of creosote in the marine environment that will be achieved at the site from the proposed timber removal and isolation activities.

Additional maintenance and repair activities will occur over or in water as part of this project (most repair activities will be conducted out of the water, either during low tide or from over-water structures). These activities consist of:

- Repair of the existing timber bulkhead along the north shoreline
- Repair/replacement of damaged timber piles associated with the existing wharf and north timber bulkhead and the north existing travel lift float
- Repair/replacement of selected structural elements of the existing wharf.

Preliminary estimates indicate that proposed in-water activities at the project site will result in the loss of about 0.18 acre of intertidal habitat (above -4 ft MLLW) and 0.23 acre of shallow subtidal habitat

(between -4 ft and -10 ft MLLW), and an increase of 0.46 acre of deep subtidal habitat (below -10 ft MLLW). As discussed in Section 3.3.7, these losses will be offset by concurrent new habitat construction along the Squalicum Outer Harbor breakwater. The planned habitat construction element of the project was developed to be consistent with the habitat restoration goals and objectives of the Comprehensive Strategy. The selected habitat restoration site is one of the high priority habitat action sites identified in the FEIS (Anchor Environmental 2000), and will provide significant habitat restoration in addition to compensatory mitigation.

Ecology, Washington Department of Natural Resources (DNR), and Washington Department of Fish and Wildlife (WDFW) have an inter-agency agreement with a preference for “the use of materials (such as untreated wood, precast concrete, steel or plastic) that have a lower potential to release toxic chemicals” than treated wood. The selection of materials for this project is consistent with the intent of this agreement and greatly reduces the presence of creosote treated wood, which is considered the greatest hazard of the materials typically used for marine construction. A white paper on chemical contaminants in treated wood and the potential for adverse impact to salmon was prepared for Ecology, WDFW, and WDOT by Battelle (Battelle 2001). The white paper identifies creosote treated wood as a greater hazard (to salmon and other aquatic species) than ammoniacal copper zinc arsenate (ACZA) treated wood, and states a general preference for metals treated wood as more environmentally friendly (than creosote). The project is removing a large amount of creosote treated wood, and replacing it with steel or ACZA treated wood. The following actions, described in greater detail in the following sections of this report, will be taken to remove creosote treated wood and replace it with more environmentally friendly materials:

- 95 creosote support piles and 5,300 ft² of creosote treated timbers associated with the marine railway will be removed and replaced with 26 steel piles that will be installed to support the new 150-ton travel lift
- 10 creosote treated mooring piles adjacent to the north side of the marine railway, and about 20 derelict pile stubs, will be removed and not replaced
- 57 creosote treated piles and 5,400 ft² of creosote treated timber lagging associated with Segments A and B of the bulkhead will be isolated from the marine environment by the new steel bulkhead
- At least 800 ft² of creosote treated lagging associated with Segment C of the bulkhead will be isolated using ACZA treated wood lagging
- 16 creosote treated fender piles along the south side of the wharf will be replaced with ACZA treated piles
- 6 creosote treated piles associated with the new wharf and 5 piles associated with north travel lift float will be replaced with ACZA treated piles.

In addition to the above removal/replacement actions, other mitigation strategies recommended by the treated wood white paper will be employed:

- Pile stubs that cannot be removed will be cut off below the mud line
- In-water activities will be conducted when juvenile salmon will not be present in the area to allow time for sufficient weathering of the ACZA treated wood before there is any exposure to juvenile salmon
- Treated wood stored at the project site will be properly managed prior to installation to minimize the release of contaminants.

The in-water and over-water construction and maintenance activities are described in more detail in the following sections.

3.3.1 SEDIMENT DREDGING AND BACKFILLING

Sediment dredging will be conducted to remove contaminated sediment to the interim action sediment cleanup levels identified in Section 2.5, and to achieve minimum vessel draft requirements for access to the boatyard. Up to about 8,000 cy of silt and sand material will be removed to achieve these goals (this volume includes an allowance for up to 1 ft of overdredge below the design dredge depth). Of this volume, 7,600 cy will be removed to remediate contaminated sediment and 400 cy will be removed to achieve minimum vessel draft requirements in the vicinity of the new 150-ton travel lift.

Contaminated sediment removal areas will include the impacted area west of the new sheet pile bulkhead and the entire marine railway well area east of the new sheet pile bulkhead, as shown on Figure 10. As discussed in Section 2.2.2, the vertical extent of contamination is limited to the upper 4 ft of sediment. The planned sediment dredging depths shown on Figure 11, as well as on the cross sections on Figures 12 and 13, were developed to remove the upper 4 ft of sediment within the identified zone of contamination, to the extent practicable given existing site constraints.

To achieve minimum vessel draft requirements for access to the new boatyard facilities, additional sediment dredging to -10 ft MLLW will be conducted to within about 25 ft of the new sheetpile bulkhead across the alignment of the marine railway where the new travel lift structure will be constructed. This area of additional sediment dredging is indicated on Figure 11 and Cross Section A-A' on Figure 12. Note that the original USACE permitted dredge depth was -12 ft MLLW, with an additional 1 ft over-dredge allowance, so the proposed dredging effort represents maintenance dredging to restore previous permitted vessel drafts.

The presence and condition of existing marine structures within and directly adjacent to the work areas present certain requirements and constraints on sediment dredging activities, including the following:

- The marine railway structure must be removed to allow dredging in front of the bulkhead and within the marine railway well area. Dredge access is the primary reason that the railway will be removed.
- The new sheetpile bulkhead along the east side of the dredge area must be installed prior to dredging in front of the bulkhead, to avoid undercutting and destabilizing the existing timber pile and lagging bulkhead.
- Bathymetry along the north side of the dredge area, both under the timber wharf and in the adjacent unshaded intertidal area in the northeast corner of the site where it is desirable to maintain existing grades, prevents setting the toe of the dredge cut at the southern edge of the wharf. To avoid undercutting the slope under the wharf and in the adjacent intertidal area, the toe of the dredge cut has been offset approximately 12 to 13 ft south to allow an approximate 1.5H:1V to 2H:1V cutslope to daylight near the southern the edge of the wharf, as shown on Figures 10 and 11 and the cross sections on Figure 13.
- The north and south floats and access ramps associated with the existing 35-ton travel lift pier will be temporarily relocated to facilitate sediment dredging. However, the presence of the 6-ft wide travel lift piers and associated piles and cross bracing will likely preclude complete removal of sediment directly under the piers to the 4-ft design dredge depth. Assuming that vertical cuts on each side of each pier will slough to 1.5H:1V, it is possible that a 2-ft high wedge of sediment might remain directly under the piers, as indicated on Detail A on Figure 13.
- The need for maintaining boat access to the adjacent Squalicum Outer Harbor facility, the presence of the floating piers directly adjacent to certain dredge areas, and the overall space constraints at the site will limit the contractor's overall production rate.

Sediment dredging will be conducted using barge-mounted mechanical clamshell dredge equipment, with the dredged material placed on an adjacent barge and dewatered prior to offloading. Free water released from sediment upon placement on the barge will be allowed to drain back to surface water, and straw bales or geotextile filter material would be placed at the weep holes in the sides of the barge if needed to limit loss of material and control turbidity. Land-based excavation equipment will be used to excavate sediment and remove debris within the marine railway well, with such equipment removing intertidal sediment near the bulkhead line "in the dry" during low tide and potentially placing excavated material directly into shore-based containers or trucks.

Dredge material handling and disposal requirements will depend on the disposal facility ultimately selected for the project. Material handling and disposal options currently include:

- Offloading the material from the barge at a designated upland location along the north side or near the northeast corner of the site, and transfer to lined rail cars for transport to an upland

landfill disposal facility. The offloading area would be lined to facilitate containment and collection of any material spillage during the material transfer operations. Any free water generated during upland handling of sediment will be contained, transported, treated and disposed of consistent with applicable laws and regulations.

- Transporting the material by barge to an upland landfill that has facilities for offloading the barge and transferring the material to the upland disposal facility. Any free water present on the barge at the time of departure from the site will be contained for treatment and disposal in conjunction with sediment at the upland disposal facility.

As indicated on Figure 14, selected areas of the site will be backfilled with clean imported granular fill material. The fill material will be a granular soil in the sand to gravel range with a relatively low percentage of fines (less than about 4 to 5 percent material passing the U.S. No. 200 sieve) to limit turbidity and facilitate placement. The areas to be backfilled include:

- Areas that are dredged to remove contaminated sediment to depths below a neat line elevation of -13 ft MLLW that will be backfilled up to -13 ft MLLW, which is within the -12 ft authorized dredge depth with the 1 ft overdredge allowance. The post sediment dredging and backfilling contours are shown on Figure 15.
 - These areas will be backfilled with granular fill material delivered to the site by barge and placed with a clamshell bucket. Because of the low percentage of fines, the imported backfill material is predicted to settle freely through the water column and spread evenly onto the sediment surface to be backfilled.
 - It is estimated that up to about 1,600 cy of imported granular fill material will be placed to backfill these lower dredge areas back up to -13 ft MLLW.
- The marine railway well area behind the new sheetpile bulkhead that will backfilled up to about 14 ft MLLW and paved to match existing upland site grades.
 - This area will be backfilled with granular fill material delivered to the site by truck, and placed and compacted with conventional earthwork equipment to meet the project requirements for structural backfill to support wheel loads associated with the new 150-ton travel lift hoist. (It is possible that the lower portions of the excavation will be backfilled with quarry spalls to facilitate compaction of the overlying structural fill material.)
 - It is estimated that up to about 1,200 cy of imported granular fill material will be placed to backfill the marine railway well area.
- The nominal 3 ft wide space between the existing timber bulkhead and the new sheetpile bulkhead that will backfilled up to about 14 ft MLLW to match existing upland site grades (refer to Section 3.3.2 and Figure 17).
 - This area will be backfilled with a free flowing granular fill material (such as pea gravel) delivered to the site by truck, and placed with conventional earthwork equipment.
 - It is estimated that up to about 400 cy of imported fill material will be placed to backfill the space between the existing timber bulkhead and the new sheetpile bulkhead.

- The nominal 4 inch-wide space between the existing Segment C timber bulkhead and the new timber lagging used for repair would backfilled up to the top of the new lagging. This area would receive up to about 80 cy of fill (e.g., pea gravel), as shown on Figure 19b.

3.3.2 BULKHEAD REPLACEMENT

To facilitate sediment dredging, and as part of the planned site improvements, the timber bulkhead along the east shoreline in Segments A and B will be replaced with a galvanized-steel sheetpile bulkhead and tieback system installed directly in front of (i.e., waterward of) the existing creosote-treated timber pile and lagging bulkhead. The alignment of the new sheetpile bulkhead is shown on Figure 16, and a generalized cross section of the bulkhead replacement area is shown on Figure 17. The new steel sheetpile bulkhead will be about 368 ft long, and will tie into the existing steel sheetpile bulkhead at the south end of Segment A near the Bellingham Yacht Club.

The new sheetpile bulkhead along the east side of the dredge area in Segment B will close off the existing marine railway well, and must be installed prior to dredging to avoid undercutting and destabilizing the existing timber bulkhead structure. The steel sheetpile sections will be driven to design depth with an impact or vibratory hammer mounted on a land- or barge-based crane, depending on site constraints and the contractor's preference. The new bulkhead will be anchored by tieback rods connected to anchors installed along the upland portion of the site.

The existing timber bulkhead will remain in place behind the new bulkhead structure; however, the new sheetpile bulkhead will completely encase the old creosote-treated wood bulkhead. As a result of this bulkhead replacement, about 110 creosote-treated piles and about 3,600 ft² of creosote-treated wood lagging will have been removed from direct contact with the marine environment. The new bulkhead will dampen, but not completely eliminate, surface water and groundwater interaction. As a result, groundwater will contact creosote treated wood prior to discharge to surface water. However, the potential for significant release of contaminants associated with creosote (e.g., PAHs) is very small because of their low solubility and the dampening effect of the new bulkhead. The creosote bulkhead isolation is an important part of this remediation project because the bulkhead vicinity comprises a significant part of intertidal habitat used by juvenile salmonids within the project site.

As indicated on Figure 17, the new sheetpile bulkhead will be driven up to 3 ft in front of the existing timber lagging to accommodate the variable alignment and occasional outward tilting of the existing timber bulkhead. The space between the existing and new bulkhead will be backfilled with imported fill material to match existing upland site grades. The filling of this narrow band of existing intertidal habitat along the existing bulkhead (about 920 ft²), combined with the filling of the existing marine railway well area (about 2,700 ft²), results in the filling/loss of about 0.083 acres of intertidal

habitat in this area of the site. This will be mitigated by construction of new marine habitat along the Squalicum Outer Harbor breakwater, discussed in Section 3.3.7.

3.3.3 MARINE RAILWAY REPLACEMENT WITH NEW TRAVEL LIFT

The primary purpose for removal of the marine railway is to allow access to underlying sediment for contaminant removal. In conjunction with sediment dredging activities, the components of the existing marine railway will be demolished and disposed at an appropriate offsite location to allow construction of the new 150-ton travel lift finger piers along the railway alignment. The location of the existing marine railway is shown on Figures 3 and 10, the alignment of the new travel lift piers is shown on Figure 16, and a generalized section of the new travel lift pier structure is shown on Figure 18.

The various components of the marine railway will be cut or dismantled using both barge-mounted and land-based mechanical equipment and brought to an upland area of the site for size reduction and salvaging/disposal activities. The creosote-treated timber piles located beyond the bulkhead line (approximately 105 piles, including the 10 mooring piles located north of the railway) will be pulled or cut off below the final dredge mudline elevation. Unless suitable for salvaging and reuse by the contractor, the piles and timbers will be cut to appropriate lengths and disposed of at an appropriate upland landfill facility. The steel components of the marine railway platform and the steel rails will be salvaged or recycled. As previously discussed, land-based excavation equipment would be used to excavate sediment and remove debris within the marine railway well as part of sediment dredging activities, and any timber piles and structural components within or near the railway well area that might interfere with installation of the new steel sheetpile bulkhead/tieback system or the new travel lift pier structure will be cut off or removed. As discussed in Section 3.3.1, the marine railway well area behind the new sheetpile bulkhead will then be backfilled with imported backfill material up to about Elevation 14 ft MLLW to match existing upland site grades.

The new finger piers for the 150-ton travel lift will be installed following completion of sediment dredging activities. As shown on Figures 16 and 18, each concrete finger pier will be 6 ft wide and approximately 145 ft long, with an average 105-ft length extending out beyond the alignment of the new bulkhead. Each finger pier will have a 2.5-ft wide steel or aluminum open-grated walkway and a handrail attached to the outer edge of each pier. The two finger piers will be supported by 26 two-ft dia. open-ended, galvanized or coated steel pipe piles driven to an appropriate embedment depth below the final mudline with an impact hammer and leads mounted on a barge-based crane. The top elevation of the finger piers will be about 14 ft MLLW to match existing site grades.

The new finger piers will partially shade about 330 ft² (<0.01 acre) less marine habitat than the former marine railway. Additionally, the shading effects will be less severe because the height of the

piers over the marine substrate is much greater than the existing in-water marine railway structure and the narrow profile of the piers will result in only transient shading. The finger piers will partially shade about 50 ft² of intertidal habitat between -2 and -4 ft MLLW and about 2,100 ft² of subtidal habitat between -4 and -11 ft MLLW.

The amount of creosote-treated wood that will be removed from the marine environment by dismantling the marine railway is about 5,300 ft² plus about 125 piles.

3.3.4 SEGMENT C BULKHEAD REPAIRS

The timber bulkhead located under the wharf along Segment C has timber lagging and scour damage. The portion of the Segment C bulkhead requiring lagging repair is shown on Figure 16, and a cross section of the Segment C wharf and bulkhead is shown on Figure 19a. The repairs will consist of installing vertical metal channels along existing piles and attaching ACZA-treated wood lagging between the channels, water-ward of the failing lagging. The nominal 4-inch space between the old and new lagging will be backfilled with a clean granular material to further isolate the old creosote-treated lagging from the marine environment (Figures 19a and 19b). The filling of this narrow band of existing intertidal habitat along the existing bulkhead (about 120 ft²) results in the filling/loss of about 0.003 acres of intertidal habitat in this area of the site.

The existing timber bulkhead along Segment C also contains two timber piles (Nos. 79 and 85) with less than 90 percent remaining cross sectional area that will be repaired by removing the wharf decking near each damaged pile, using land-based pile driving equipment to install galvanized steel H-piles on both sides of each damaged pile, and installing a galvanized channel to secure these H-piles to the existing tieback rod. This timber bulkhead pile repair scheme is shown on Figure 20.

3.3.5 TIMBER PILE REMOVAL, REPLACEMENT, AND REPAIRS

Based on the underwater pile condition surveys performed in 2002, timber piles at the site with less than 90 percent remaining cross sectional area will be repaired/replaced as appropriate. The locations of the deteriorated timber piles are indicated on Figures 3 and 16 (as well as on other plan views), and include:

- 2 piles along the bulkhead in Segment C (to be repaired as discussed in Section 3.3.4)
- 6 piles under the wharf in Segment C (to be repaired/replaced)
- All 16 fender piles along the south side of the wharf in Segment C (to be replaced)
- 5 of the 15 piles supporting the north travel lift float (to be replaced)
- 3 piles along the bulkhead in Segment C (to be left in place behind the new bulkhead).

Certain timber piles no longer in use will be pulled/vibrated out of the sediment, if practicable, or cut off slightly below the final mudline elevation. These include about 105 piles supporting the portion of the marine railway located beyond the bulkhead line, about 10 mooring piles located north of the marine railway, about 30 piles located within the marine railway well, and about 20 derelict pile stubs located adjacent to the Segment C bulkhead. Additionally, all of the piles supporting the north travel lift float will need to be removed and replaced to allow temporary relocation of the float during sediment dredging activities. Unless suitable for salvaging and reuse by the contractor, the piles will be cut to appropriate lengths and disposed of at an appropriate upland landfill facility. Creosote-treated piles removed from the marine environment may be temporarily stockpiled on the upland portion of the site, with runoff from the stockpile area to be collected and treated by the boatyard stormwater treatment system.

Existing deteriorated timber pier piles will be repaired, removed and/or replaced by one or a combination of the following methods. Piles may be cut at or slightly below the mudline and a new pile secured directly on top, fully extracted with or without replacement, or removed by cutting off the pile below the mudline. Replacement timber piles and pile sections will be ACZA-treated.

Piles deemed to be repairable may be repaired using a fiberglass or steel casing that is subsequently filled with concrete; such casings will extend from approximately 2 ft below the mudline up to the bottom of the pile caps.

Replacement piles will be ACZA-treated timber piles (or steel piles if appropriate). Replacement piles will be driven to design depth using barge- or land-based pile driving equipment, as determined to be most appropriate by the contractor. The choice of pile materials will depend on available funds and the intended application.

3.3.6 SEGMENT C WHARF REPAIRS

In addition to the pile repair/replacement activities discussed in Section 3.3.5, certain structural repairs will be made to the existing timber wharf along Segment C as part of site redevelopment. The location of the wharf is shown on Figure 16 and a cross section of the wharf and bulkhead is shown on Figure 19a.

The wharf rehabilitation activities will include repair/replacement of selected timber pile caps, stringers, decking, chocks, and bullrailing. New timber cross bracing will also be added to the wharf as needed. Most of these activities will occur above the mean higher high water elevation.

3.3.7 MARINE HABITAT CONSTRUCTION

The project will incorporate compensatory habitat creation along a portion of the existing riprap breakwater on the west (seaward) side of Squalicum Outer Harbor. The general location and configuration of the marine habitat area is shown on Figures 2 and 21, and a cross section is shown on Figure 22.

Habitat will consist of a shallow subtidal bench at about -4 ft MLLW, with a 5H:1V outer slope descending to the existing mudline elevation of approximately -12 ft MLLW. The goal of the marine habitat design is to create a minimum of 2 acres of shallow subtidal habitat above -10 ft MLLW, including a minimum of 1 acre of habitat between -4 and -6 ft MLLW. This new habitat will result in at least a 2:1 compensation ratio to address project impacts, plus additional habitat to concurrently fulfill enhancement and restoration objectives and ensure maintenance of compensatory habitat over time.

Habitat will be constructed using approximately 30,000 to 35,000 cy of Squalicum Waterway dredged material designated for beneficial reuse and made available through a separate USACE maintenance dredging project scheduled for the fall of 2003. The Puget Sound Dredge Material Management Office (DMMO) has determined that all of the Squalicum Waterway maintenance dredge materials are suitable for unconfined, open-water disposal or beneficial reuse. It is expected that most of the available dredge material will be fine-grained silt to clayey silt material with greater than about 90 percent material passing the U.S. No. 200 sieve.

Only sediment from Squalicum Channel dredge material management units (DMMUs) that exhibit chemical concentrations below SQS will be used for the habitat site fill. Based on data available from the Squalicum Channel Puget Sound Dredge Disposal Analysis (PSSDA) sediment characterization report (Striplin Environmental 2000), DMMUs C3, and C5 through C11 are the most appropriate for use as habitat fill.

Habitat construction material will likely be transferred to the outer breakwater area using bottom-dump barges, which will be used to place the majority of the habitat material up to approximately Elevation -4 ft MLLW. Above that elevation, or when tides drop to depths too shallow to operate a bottom-dump barge, the habitat material may need to be placed with mechanical clamshell equipment.

The habitat material will be placed in a series of relatively thin lifts, with a designated waiting period between placement of successive lifts to allow the material to consolidate and gain strength. The habitat surface will be constructed to an elevation of approximately -4 ft MLLW, as shown on Figure 22. The slope of the habitat bench surface will not exceed about 10H:1V, and in most areas will be flatter than about 20H:1V. The contractor will monitor lift thickness and bench elevations and slopes during and immediately following construction.

A preliminary evaluation of the potential settlement of the habitat bench was conducted, based on primary consolidation of the underlying soft Bellingham Bay sediments due to the weight of the bench fill material; the results of this evaluation indicate that about 6 to 12 inches of settlement might be expected to occur during and following bench construction. Most of the settlement is expected to occur within the first year following construction.

A preliminary slope stability evaluation of the habitat bench was also conducted under both static and dynamic (pseudostatic) seismic loading conditions using the program XSTABL to compute the factor of safety against slope failure at various locations through the habitat bench fill and underlying sediments. The preliminary static analyses indicated a factor of safety against slope failure greater than 2.5. Slope stability analyses under seismic conditions were performed using a horizontal pseudostatic coefficient (k_h) to represent the effects of the design level earthquake. A horizontal pseudostatic coefficient of $k_h = 0.118$ was chosen for a design level earthquake with $a_{max}/g = 0.237$. The preliminary dynamic analyses indicated a factor of safety against slope failure greater than 1.1. Thus, the constructed habitat bench is expected to be stable under reasonable worst case conditions, including seismic events.

Because of the fine-grained composition of the Squalicum Waterway dredge material, turbidity levels generated during fill placement will be greater than turbidity levels generated during project site dredging or backfilling activities. However, the Squalicum Waterway dredge material is highly desirable for habitat construction because the fine-grained material and organic content will provide excellent colonization potential for aquatic invertebrates and eelgrass.

An important design objective for the habitat bench is to maintain its integrity with relatively little erosion during peak waves and tidally induced currents. The bench has been designed to ensure stability under reasonable worst-case wave conditions. Additional stability analyses were conducted to predict erosion during annual and 5-year waves at the most sensitive tidal stage. These analyses showed that the upper bench elevations should be stable between -4 and -6 ft MLLW. Based on these evaluations, the Squalicum Waterway dredge materials are expected to be sufficiently strong to resist erosion from ambient waves. Colonization of the habitat surface by eelgrass, which is expected to occur, would provide further protection from erosion over time. A more detailed discussion of the erosion analysis is presented in Attachment 1 to the compliance monitoring plan (Appendix C).

3.4 CONSTRUCTION TIMING

Project construction, including the in-water activities, is expected to take about 5 months. The table below shows the estimated duration of each project component. It should be recognized that the duration and the total period of in-water work will be affected by a number of factors, including:

- The type of equipment and construction procedures used by the contractor

- The sequencing of work elements
- The availability and delivery schedule for construction materials
- The length of daily in-water work periods, which may be affected by minimum vessel draft requirements and ongoing boatyard activities
- Dredging and backfill placement rates, which may be affected by engineering controls, site access limitations, and water quality considerations.

As such, the estimates of project activity duration presented below should be considered advisory and will vary based on the considerations described above.

ESTIMATED DURATION OF PROJECT IN-WATER ACTIVITIES

PROJECT COMPONENT	ESTIMATED DURATION
Bulkhead Replacement	6 to 8 weeks
Dredging	3 to 4 weeks
Backfilling	1 week
Marine Railway Removal	1 to 2 weeks
Pile Removal	1 week
150-ton Travel Lift Installation	8 to 10 weeks
Wharf and Bulkhead Repairs	2 to 4 weeks
Fender Pile Replacement	1 week
Marine Habitat Construction	4 to 8 weeks

To avoid disturbance to late outmigrating juvenile salmon, the Services have specified an in-water construction period of September 1, 2003 to February 15, 2004. All in-water work will occur during daylight hours, except that sediment removal within the marine railway well may occur at night to maximize the amount of contaminated sediment removed “in the dry” during extreme low tides.

3.5 COMPLIANCE MONITORING

In accordance with MTCA requirements in WAC 173-340-410, a compliance monitoring plan was developed for the interim action activities and is attached as Appendix C to this work plan. Compliance monitoring activities for the project will include:

- Protection monitoring to confirm that human health and the environment are adequately protected during construction of the interim action

- Performance monitoring to confirm that the interim action has attained the sediment cleanup standards established for the project and other performance standards (such as construction quality control monitoring necessary to demonstrate compliance with project permits), and
- Confirmational monitoring to confirm the long-term effectiveness of the interim action once the cleanup standards and other performance standards have been attained.

The compliance monitoring plan (Appendix C) addresses surface water quality monitoring during dredging and filling activities and post-construction sediment quality monitoring, and should be reviewed for a more thorough discussion of the bases for and scope of the proposed compliance monitoring activities.

4.0 USE OF THIS REPORT

This work plan has been prepared for the exclusive use of the Port of Bellingham for specific application to the Gate 2 Boatyard project. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

This document has been prepared under the supervision and direction of the following key staff.

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